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Nine new earthworm species of *Proandricus* Plisko, 1992 from South Africa and Lesotho (Oligochaeta: Microchaetidae)

by

Jadwiga Danuta Plisko

(Natal Museum, P. Bag 9070, Pietermaritzburg 3200, South Africa;
dplisko@nmsa.org.za)

ABSTRACT

Nine new microchaetid species of *Proandricus* Plisko, 1992 are described and illustrated: *P. armstrongi*, *P. crookesi*, *P. dwesa*, *P. injasuti*, *P. martensi*, *P. michelleae*, *P. richerti*, *P. hlatikulu* from South Africa, and *P. sani* from Lesotho. They are assigned to five species-groups proposed by Plisko (2000*b*): *armstrongi* to the *P. marleyi* species-group; *crookesi* to the *P. warreni* group; *dwesa*, *injasuti*, *martensi*, *michelleae* and *richerti* to the *P. colletti* group; *hlatikulu* to the *P. belli* group; *sani* to the *P. lesothoensis* group. The earlier known species of this genus remain in the *P. marenzelleri* species-group and in the *P. timmianus* group as proposed by Plisko (1993). For *sirgelli* the new *P. sirgelli* species-group is proposed. A key to the species-groups is provided.

The majority of species was collected in Nature Reserves. Three species were found in natural habitats outside conserved areas, but away from human activities. Conservation of indigenous soil fauna is recommended.

INTRODUCTION

This paper is a sequel to my earlier papers on the genus *Proandricus* Plisko, 1992 (Plisko 1992 1993 1994 1996 2000*b*). A considerable quantity of additional earthworm material has become available, and new proandric species of Microchaetidae have been identified. Earthworms collected during the past four years by staff members of the Natal Museum and the University of Natal were studied, and five new species of *Proandricus* were identified. Another new proandric species was discovered in the Vernon Crookes Nature Reserve. In addition, Dr A. J. Armstrong of the KwaZulu-Natal Conservation Service recently presented a collection of earthworms assembled in nature reserves. It was found to contain three new species, for which names are required for biodiversity studies. The genus *Proandricus* now contains 46 species.

The new species are allocated to five of the species-groups established by Plisko (2000*b*), using the distribution of spermathecal pores and the thickness of septa. The earlier known species: *algoensis*, *marenzelleri*, *mirificus* and *brincki* remain in the *P. marenzelleri* species-group. The following species remain in the *P. timmianus* species-group: *biancae*, *briani*, *ianthinos* and *timmianus*. For *sirgelli*, a unique species among all proandric species having four pairs of spermathecal pores, the new *P. sirgelli* species-group is proposed. A key for eight recognised species-groups is given.

MATERIAL AND METHODS

Examined specimens had been narcotised in 20–45 % ethyl alcohol, then after about one hour transferred into 4 % formalin for one day, thereafter preserved in 75 % ethyl alcohol. Descriptions are based on preserved material, apart from data relating to the colour and measurements of living specimens, if such data were recorded at the time of collection. Studies of internal anatomy were done through dorsal dissections. Information provided under 'material examined' is derived from the labels; in some cases additional information on the collection sites is included in square brackets. Any additional verbal information obtained from the collectors, and some extended data on the localities derived from Pooley & Player (1995), are included under 'Biological notes'. All material is in the Natal Museum Oligochaeta Collection. Photographs were taken using a WILD photomicroscope.

TAXONOMY

Proandricus Plisko, 1992

Proandricus Plisko, 1992: 354. Type species: *P. thornvillensis* Plisko, 1992 by original designation.

Key to species-groups recognised in the genus *Proandricus*

1 Spermathecal pores in only one intersegmental furrow 10/11, or in two intersegmental furrows 9/10 and 10/11, or between ringlets of segment 9 and in intersegmental furrow 10/11 .... **lesothoensis** species-group
– Spermathecal pores in intersegmental furrows other than 9/10 or 10/11 or between ringlets of segment 9 2

2 Spermathecal pores in only one intersegmental furrow 12/13 .... **warreni** species-group
– Spermathecal pores in more then in one intersegmental furrow 3

3 Spermathecal pores in two intersegmental furrows: 11/12 and 12/13, or in 12/13 and 13/14 4
– Spermathecal pores in three or four intersegmental furrows 7

4 Spermathecal pores in 11/12 and 12/13 5
– Spermathecal pores in 12/13 and 13/14 .... **marenzelleri** species-group

5 Only two septa 7/8 and 8/9 thickened, these septa of similar size and appearance, or of different thickness .... **colletti** species-group
– More than two septa thickened 6

6 Three septa 4/5 7/8 8/9 thickened, with septa of similar size and appearance, or septa differently sized, or with septum 4/5 extremely thickened .... **belli** species-group
– Septum 5/6 also thickened: 4/5 5/6 7/8 8/9 or 5/6 7/8 8/9, with variable thickening and appearance .... **marleyi** species-group

7 Spermathecal pores (observed externally) in three intersegmental furrows 11/12 12/13 13/14 .... **timmianus** species-group
– Spermathecal pores in four intersegmental furrows 12/13 13/14/ 14/15 15/16 **sirgelli** species-group

lesothoensis species-group

To this group are assigned *P. lesothoensis* (Reinecke & Ryke, 1969), *P. pajori* Plisko, 1993, and *P. bourquini* Plisko, 1996.

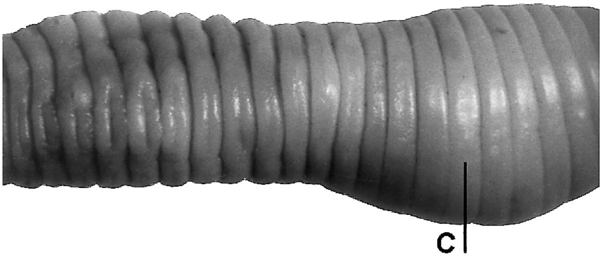


Fig. 1. *Proandricus sani* sp. n. Clitellar part of body, ventral view. [C = clitellum.]

Proandricus sani sp. n.

(Fig. 1)

Etymology: Named after the type locality, Sani Plateau.

Material examined: LESOTHO: Holotype NMSA/Olig.02715 mature, clitellate, Sani Plateau (29°35'S:29°16"E) [in summit area of Drakensberg, near South African border] at *ca*. 2906 m, under rock, 12 February 1998, M. Hamer & K. Martens leg.

Description based on holotype.

External characters:

General: Body cylindrical, compact. *Colour*: In life probably violet on whole length of body; alcohol-preserved anteriorly dorsally violet, postclitellarly only in a strip parallel with dorsal blood vessel, ventrally whitish-grey. *Dimensions*: Preserved and slightly contracted 70 mm long, at segment 10 and at tubercula pubertatis 6 mm wide. *Segment number*: Holotype 98 with partly regenerated segments 64–67. *Prostomium*: Prolobous, moderate. *Segmentation*: Secondary annulation present on preclitellar segments; segment 1 simple, with irregular longitudinal grooves; 2 and 3 simple; 4–8 with two simple ringlets similar in size and appearance; 9 with two simple ringlets, second shorter than first. *Setae*: Minute; preclitellarly and on some clitellar segments *ab* are irregularly shifted to *cd* position; postclitellarly in regular lumbricinae arrangement. *Nephridial pores*: Conspicuous; in *cd* setal lines. *Female pores*: In 14, laterally, slightly below *cd* setae. *Male pores*: Externally not observed, probably in intersegmental furrow 16/17, where vasa deferentia enter body wall. *Spermathecal pores*: Externally not observed; position of first pair of spermathecae, observed during dissection, indicates the furrow between two ringlets of segment 9; the second pair located in segment 10 has its pores in intersegmental furrow 10/11.

Clitellar region: *Clitellum* (Fig. 1): Not well developed, segmented, whitish-grey, extends over segments 12–21; anterior border not well marked, posterior border distinct; ventral borders along *cd* setal lines, weakly marked. *Tubercula pubertatis*: Probably also not fully developed, on 16–19, extending slightly onto segment 20; between *cd* and *ab* setae, with elevated rims, consisting of four separated transverse pads; a shallow groove divides each pad into two parts; on segment 20 only half of a pad. *Papillae*: Moderate swellings, paired, on segments 11, 12, 19 around *ab* setae.

Internal characters:

Septa: 4/5 5/6 6/7 not thickened, thin, firm; 7/8 and 8/9 thickened moderately, muscular, thick, similar in size and appearance; other septa thin, firm. *Gizzard*: Short, muscular, soft posteriorly. *Calciferous glands*: In 9, small, globular, distinctly separated dorsally and ventrally. *Intestine*: In 12 slightly enlarged, in 13 large, folded tube. *Typhlosole*: Commences in segment 21, terminates in 55. *Dorsal blood vessel*: In 5–7 thin, double in large part, close together; in 8 double, separated; in 9 enlarged, double, cordiform; in 10 and the following segments enlarged and simple. *Paired dorsoventral vessels*: In 5–8 thin vessels, in 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; coiled loops and extended, V-shaped caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement (in segment 10); one pair of large, iridescent funnels closely connected at posterior septum of segment 10 with seminal sacs. *Vasa deferentia*: Distinct single ducts commence at dorsal parts of spermiductal funnels and run backward at each side of body to segment 16, where they enter body wall. The extended parts of the ducts in segment 16, and their connections with male pores are probably at intersegmental furrow 16/17. *Seminal vesicles*: Pair of composite sacs commence at septum 10/11 and extend into segment 11; both sacs consist of elongated lobes, variable in shape and size, each communicating with their base, connected with spermiductal funnels. *Spermathecae*: Variable in shape and size, in segments 9 and 10; anterior pair of elongated thecae enter body wall at furrow between two ringlets of segment 9; posterior pair of round ampullae with long ducts run into intersegmental furrow 10/11. *Ovaries*: Not observed. *Genital glands*: Two pairs in segments 11, 12 and 19 associated with papillae; all glands flat, two- or three-lobed, moderate in size.

Biological notes: Known from a single specimen found at a high altitude of nearly 3000 m in the Drakensberg, on the Lesotho side, near the KwaZulu-Natal border, on a mountain path under stone. This species is probably restricted to high altitudes.

Discussion: Locations of spermathecae in segments 9 and 10 suggest assignation to the *lesothoensis* species-group. However, *sani* differs clearly from the other species of this group, having an anterior pair of spermathecal pores between two ringlets of segment 9; this condition is not observed in any other known microchaetid species. In the other known species of this group, the spermathecal pores are in intersegmental furrows 9/10 and 10/11 (*lesothoensis* and *bourquini*), or only in 10/11 (*pajori*).

warreni species-group

To this group are assigned *P. warreni* (Michaelsen, 1913*a*), *P. londti* Plisko, 1993, and *P. zicsi*, Plisko, 1993.

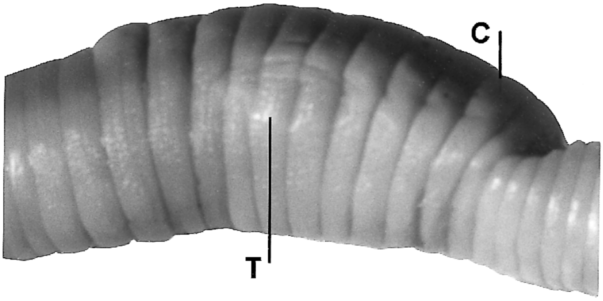


Fig. 2. *Proandricus crookesi* sp. n. Clitellar region, ventral view. [C = clitellum; T= tuberculum pubertatis.]

Proandricus crookesi sp. n.

(Fig. 2)

Etymology: Named after the late Mr Vernon Crookes who donated the property that is now the Vernon Crookes Nature Reserve, in which this and other earthworm species are protected.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Holotype: NMSA/Olig.00770 clitellate, Vernon Crookes Nature Reserve (30°18'S:30°40'E), 6 km N. of Tourist Camp, primary grassland, 22 November 1989. Paratypes: NMSA/Olig.02554 1 clitellate, abscised, collected together with holotype; NMSA/Olig.00844 1 clitellate, 3 km from type locality, on bank of small water pool, 23 November 1989; NMSA/Olig.00828 2 clitellate, 1 km W. of type locality, dug out from black soil at *ca*. 45 cm depth. Other material: NMSA/00748 1 clitellate, 8 March 1989; NMSA/Olig.00766 2 abscised anterior parts, 23 November 1989; NMSA/00768 7 specimens manifesting clitellum by brown colour, 7 March 1989; NMSA/Olig.00769 1 specimen with abnormally regenerated body part in area of clitellum, 23 November 1989. All paratypes and other material collected in neighbourhood of type locality by J. D. Plisko.

Description based on holotype and paratypes.

External characters:

General: Body cylindrical. *Colour*: In life dorsally violet, ventrally yellowish-grey; alcohol-preserved brownish-grey, with violet tint. *Dimensions*: Holotype somewhat contracted 170 mm long, 6 mm wide at 10, 8 mm at tubercula pubertatis; clitellate paratype 120 mm long, 6 mm wide at 10, 7 mm wide at tubercula pubertatis; juvenile paratypes 125–135 mm long, 5 mm wide. *Segment number*: Holotype 249; clitellate paratypes 169–328, regenerating individual 112, abscised 84+. *Prostomium*: Prolobous, small. *Segmentation*: Secondary annulation present on preclitellar segments; 1 and 2 short, not clearly separated, both with irregular longitudinal grooves; 3 simple, 4–8 with 2 simple ringlets similar in size and appearance; 9 with 2 irregularly annulated ringlets, second shorter than first; 10 and the following simple. *Setae*: Moderate in size; on preclitellar segments *ab* paired distantly, postclitellarly closely paired with *ab* = *cd*, *aa* > *bc*; first pairs of *ab* on segment 3. *Nephridial pores*: First pair in intersegmental furrow 3/4. *Female pores*: In 14, medially. *Male pores*: In area of tubercula pubertatis, in intersegmental furrow 14/15, with small swollen lips. *Spermathecal pores*: Only in intersegmental furrow 12/13, dorso-laterally in clitellar area.

Clitellar region (Fig. 2): *Clitellum*: Well developed on holotype and paratypes on 12–22, segmented; clearly bordered anteriorly and posteriorly. Ventral borders on 12–1/n18 parallel with dorsal edges of tubercula pubertatis; on 1/n18–22 extends to ventral lines of tubercula pubertatis. *Tubercula pubertatis*: Irregular oval, on segments 1/n14–1/n18, embracing the swellings of male pores; anteriorly narrower, with ventral borders much above *b* setal lines, posteriorly extending scarcely more latero-medially. *Papillae*: Small swellings associated with *ab* setae on 10–12 and 19–22, 23; paired or single.

Internal characters:

Septa: Septa 4/5 very much thickened, muscular, 5/6 6/7 very thin; 7/8 8/9 thickened moderately, both similar in size and appearance; other septa thin, firm. *Gizzard*: Barrel-shaped, in 7; anteriorly muscular, posteriorly soft. *Calciferous glands*: Dorso-lateral in

9 extending into 10; separated ventrally and dorsally; connected with oesophagus in area of septa 9/10. *Intestine*: Commences in 12. *Typhlosole*: Commences abruptly as thick U-shaped tube in 19 or 20; terminates in holotype in segment 144; in complete paratype in 146; in abscised individual extends through all regenerated segments to the last segment 112. *Dorsal blood vessel*: Double in 5–9; in 5–7 thin adjacent tubes, in 8 moderately enlarged, separated; in 9 cordiform. Single, thin when crossing septa, and single although thicker in 10, and in the following segments. *Paired dorsoventral vessels*: In 4–7 simple, thin vessels, in 8 slightly enlarged, 9–11 gradually enlarging, moniliform. *Nephridia*: Meganephridia; coiled loops with oblong caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement (in segment 10); one pair of large funnels enclosed in sacs closely connected one with another and with seminal sacs. *Vasa deferentia*: In holotype not seen, covered by thick tissue of body wall. In paratype observed as single ducts running to anterior part of segment 15, and entering body wall at 14/15, where externally are noticeable male pores. *Seminal vesicles*: Moderate in size, anteriorly connected with spermiductal funnels at septum 10/11, extending into segment 11. *Spermathecae*: In only one row, close to septa 12/13; tubular, bent, two at each side; modest quantity of sperm observed in some of spermathecae. *Ovaries*: Large rosette-like funnels, posteriorly in segment 13, close to median line. *Genital glands*: Not observed.

Biological notes: Found in the soil of primary grassland conserved in the Vernon Crookes Nature Reserve. The reserve is situated in the southern part of coastal KwaZulu-Natal, surrounded by sugar cane fields and *Eucalyptus* plantations. This small reserve, comprising patches of indigenous coastal forest, bush clumps and extensive stands of grassland, is a valuable oasis of relict habitats. Close to the type locality of *P. crookesi*, four other indigenous microchaetids in two other genera were previously collected and described: *Tritogenia curta* Plisko & Zicsi, 1991, *Microchaetus vernoni* Plisko, 1992, *Microchaetus zaloumisi* Plisko, 1992, and *Microchaetus ambitus* Plisko, 1998.

Discussion: Closely related to *P. warreni* (Michaelsen, 1913*a*). Both species have only one row of spermathecal pores in intersegmental furrow 12/13, and thickened septa 4/5 7/8 8/9. However, the thickness of septum 4/5 in this new species distinguishes it from other species assigned to the *P. warreni* species-group. The position and shape of the clitellum and tubercula pubertatis also differ.

belli species-group

To this group are assigned *P. belli* (Benham, 1892), *P. beddardi* (Benham, 1886), *P. modestus* (Michaelsen, 1899), *P. magdae* Plisko, 1993, *P. skeadi* Plisko, 1993, *P. perolofi* Plisko, 1994, *P. setosus* Plisko, 1996.

Proandricus hlatikulu sp. n.

(Fig. 3)

Etymology: Named after the type locality, Hlatikulu Forest.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Holotype: NMSA/Olig.03195 clitellate, Hlatikulu Forest (27°19'25"S:31°59'42"E) under leaf-litter, 13 April 2000, R. Scott-Shaw leg.

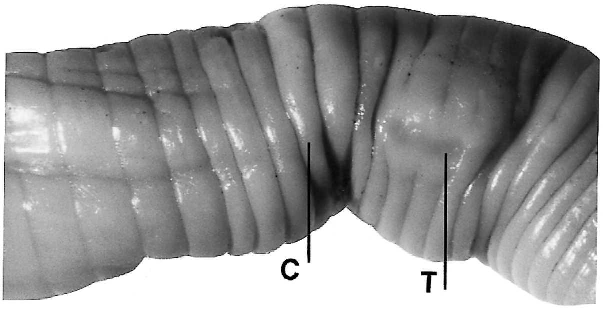


Fig. 3. *Proandricus hlatikulu* sp. n. Clitellar region, lateral view. [C = clitellum; T= tuberculum pubertatis.]

Description based on holotype.

External characters:

General: Body cylindrical. *Colour*: Alcohol-preserved yellowish-grey. *Dimensions*: Preserved and slightly contracted 130 mm long, 6 mm wide at segment 10, 9 mm at tubercula pubertatis. *Segment number*: 199. *Prostomium*: Prolobous. *Segmentation*: Secondary annulation present on preclitellar segments; 1 and 2 short, with irregular longitudinal grooves; 3 simple, longer than 1 or 2; 4–8 with 2 simple ringlets, similar in size and appearance; 9 with 2 ringlets, second shorter than first; 10,11 and postclitellar segments simple, randomly annulated. *Setae*: Small, closely paired; postclitellarly *aa* > *bc*, *ab* = *cd*. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in intersegmental furrow 3/4. *Female pores*: Conspicuous, in intersegmental furrow 13/14, medially, between setae *aa*. *Male pores*: In front of tubercula pubertatis in intersegmental furrow 14/15. *Spermathecal pores*: Difficult to observe externally; during dissection observed in intersegmental furrows 11/12 and 12/13, dorsolaterally.

Clitellar region (Fig. 3): *Clitellum*: Alcohol-preserved yellowish-white, well developed, segmented, on 12–22; clearly bordered anteriorly and evenly covering segments 12–21; ventral borders on segments 12–21 extend parallel with *cd* setal lines and dorsal rims of tubercula pubertatis; posteriorly covering only dorsal part of segment 22 and not extending to *cd* setae. *Tubercula pubertatis*: Trapezoidal, with shorter line medially, rimmed all around; dorsally bordering clitellum, ventrally extending to *ab* setae; anteriorly covering only posterior part of segment 15 and extending evenly onto 16–18; posteriorly covering only anterior part of segment 19; glandular and segmented in dorsal parts; in front of ventral rims not segmented, but with short longitudinal folds. *Papillae*: Not observed.

Internal characters:

Septa: 4/5 very much thickened, muscular; 5/6 and 6/7 very thin, although firm; 7/8 and 8/9 thickened moderately, strong, similar in appearance. Other septa thin. *Gizzard*: Short, muscular, in 7. *Calciferous glands*: Moderate in size, in 9; anteriorly slightly broader than posteriorly; widely separated dorsally, ventrally with narrow separation. *Intestine*: Commences in 13. *Typhlosole*: Commences abruptly in segment 20 as large U-shaped tube, extending in similar shape; terminates in segment 135. *Dorsal blood vessel*: In 5 simple, in 6 and 7 partly double, not separated; in 8 double, widely separated; in 9 double, enlarged, cordiform; in 10 and following segments simple, although slightly enlarged. *Paired dorsoventral vessels*: In 5–8 simple thin vessels, in 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; coiled loops with V-shaped, elongated caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement (in segment 10); one pair of large funnels, enclosed in one sac, and closely connected with seminal vesicles. *Vasa deferentia*: Very thin single ducts running at each side of the body, deeply embedded in body wall; before entering male pores at intersegmental furrow 14/15 they penetrate glandular tissue, corresponding to male pores. *Seminal vesicles*: In segment 10; one pair of small sacs closely connected with sac confining spermiductal funnels; broader at their bases, at dorsal extensions becoming slightly narrower. *Spermathecae*: In segments 12 and 13, near to septa 11/12 and 12/13. Club-shaped, elongated or slightly curved ampullae; one pair per segment; posterior pair larger than anterior; in posterior spermathecae iridescence was observed, confirming presence of sperm.*Ovaries*: Not observed. *Genital glands*: Not observed.

Biological notes: Found in northern KwaZulu-Natal on summit of Lebombo mountain range, in forest litter. This little-explored, botanically interesting forest occurs on the top of the mountain, and contains a variety of indigenous trees and shrubs (Pooley & Player 1995).

Discussion: Having three septa thickened and spermathecal pores in two intersegmental furrows 11/12 and 12/13, *hlatikulu* is assigned to the *belli* species-group. Similar to *modestus* and *setosus* in having anterior septum much thickened, but differs from both species in the shape and location of the clitellum and tubercula pubertatis. The location of female pores in intersegmental furrow 13/14, is not observed commonly in the genus, but it occurs also in *beddardi*, suggesting a relationship between these species. However, the location of the seminal vesicles, and the shape and position of the calciferous glands and clitellum, separate these species.

colletti species-group

To this group are assigned *P. colletti* (Beddard, 1907), *P. gracilis* (Michaelsen, 1907), *P. ivari* (Michaelsen, 1907), *P. babanango* Plisko, 1992, *P. bulwerensis* Plisko, 1992, *P. entumeni* Plisko, 1992, *P. jasoni* Plisko, 1992, *P. thornvillensis* Plisko, 1992, *P. comptus* Plisko, 1996, *P. adriani* Plisko, 2000, *P. bergvillensis* Plisko, 2000, *P. hedothecus* Plisko, 2000, and *P. ortyi* Plisko, 2000.

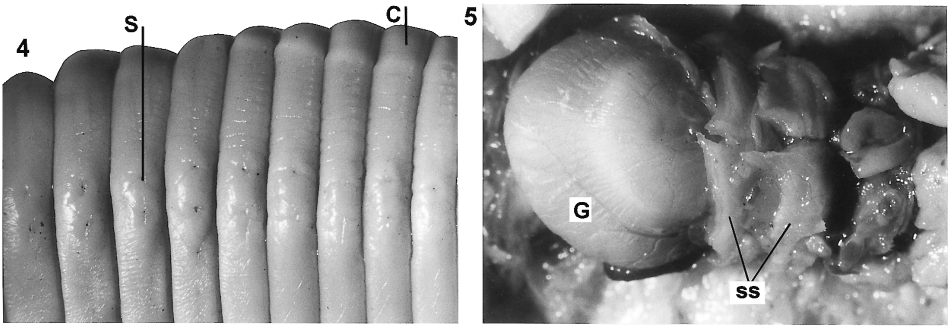
Proandricus dwesa sp. n.

Figs 4–5

Etymology: Named after the type locality, Dwesa.

Material examined: SOUTH AFRICA: *Eastern Cape*: Holotype NMSA/Olig.02807 well preserved, with distinct clitellum and slightly developed tubercula pubertatis, Dwesa Nature Reserve (32.304°S:28.828°E) coastal forest, under fallen log. Paratype: NMSA/Olig.03524 with tubercula pubertatis not clearly marked, collected together with holotype. All material collected by D. G. Herbert of the Natal Museum's Department of Malacology.

Description based on holotype and paratype.



Figs 4–5. *Proandricus dwesa* sp. n. 4. Clitellar region, ventral view. 5. Dorsally dissected preclitellar part of body. [C = clitellum; G = gizzard; S = seta *b*; SS = septa 7/8 and 8/9.]

External characters:

General: Body cylindrical. *Colour*: In life dorsally dark-grey with violet tint, ventrally yellowish-grey; alcohol-preserved dorsally and ventrally grey. *Dimensions*: In life, not stretched 350 mm long, in preclitellar area 10 mm wide, 12 mm at clitellum; preserved and contracted, holotype 243 mm long, 10 mm wide at segment 10, 15 mm at clitellum; paratype 250 mm long, 14 mm at clitellum. *Segment number*: Holotype 208, paratype 204. *Prostomium*: Prolobous, moderate in size; 1 and 2 simple, short with longitudinal grooves; 3 simple, as long as first ringlet of segment 4; 4–9 with two simple ringlets, first longer than second; 10 and 11 short, simple, similar in size to first ringlet of segment 9. *Setae*: Large; closely paired on segment 3, and on first ringlets of segments 4–9; on clitellar segments paired more distantly than preclitellarly; postclitellarly closely paired with *aa* > *bc, ab* similar to *cd*. *Nephridial pores*: Conspicuous in *cd* setal lines. *Female pores*: In 14, medially between setae *aa*. *Male pores*: Difficult to trace; in area of tubercula pubertatis are small depressions in intersegmental furrow 14/15, and are probably male pores. *Spermathecal pores*: In intersegmental furrows 11/12 and 12/13.

Clitellar region (Fig. 4): *Clitellum*: Saddle-shaped, segmented with simple segments; extending onto segments 11–22, clearly bordered anteriorly and posteriorly, with ventral borders below *cd* setae. *Tubercula pubertatis*: Not distinctly marked, however, on ventral clitellar edges of segments 1/n14–1/n19 are oblong, segmented ridges, with medial shallow, longitudinal furrows and narrow rims. *Papillae*: Paired, small indistinct swellings in the line of *ab* setae; first pair on first ringlet of segment 9, the following on segments 10–26.

Internal characters:

Septa: 4/5 5/6 6/7 thin; 7/8 thickened moderately, muscular; 8/9 thickened the most, muscular, nearly twice size of 7/8; the following septa thin, but firm. *Gizzard* (Fig. 5): In 7, bell-shaped, muscular, posteriorly soft. *Calciferous glands*: Large, in 9–10, ventrolaterally, distinctly separated dorsally. *Intestine*: Commences in 13. *Typhlosole*: Commences in 20 as large U-shaped tube; extends to nearly 2/3 of body length; terminates in holotype in segment 130, in dissected paratype in 128. *Dorsal blood vessel*: In 5–6 partly double, very close; double in whole length of segment 7, but very close; in 8 double, widely separated; in 9 double, cordiform; single when crossing septa and posterior to 9. *Paired dorsoventral vessels*: Very thin vessels in 5–8; in 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; large coiled loops, and large V-shaped caeca; in some clitellar segments caeca extends laterally, becoming ribbon-folded; postclitellarly caeca simple.

Reproductive organs: *Spermiductal funnels*: Proandric (in segment 10); one pair of funnels enclosed in separated sacs, very close ventrally; at septum 10/11 closely connected with seminal sacs. *Vasa deferentia*: Single ducts, connected with spermiductal funnels dorsally, run backward to segment 14, where covered by thick tissue of body wall enter male pores at probably intersegmental furrow 14/15. *Seminal vesicles*: One pair of large sacs anteriorly connected with spermiductal funnels at septum 10/11; in segment 11 extended transversely. *Spermathecae*: Elongate ampullae, close to septa 11/12 and 12/13; two pairs in anterior segment, three pairs in segment 12. *Ovaries*: Not observed, covered by folded nephridial loops and large caeca. *Genital glands*: Not present.

Biological notes: Collected in the Dwesa Nature Reserve, which is controlled by the Eastern Cape Department of Nature Conservation. The Reserve is situated along the coastline in the northeastern part of the Eastern Cape, in the area previously known as the Transkei. There is a mixture of vegetation ranging from coastal forest to open grassland, with Cape and KwaZulu-Natal elements, and a strong afromontane component.

Discussion: Belonging to the *P. colletti* species-group, having only septa 7/8 and 8/9 thickened, and spermathecal pores in intersegmental furrows 11/12 and 12/13. It is noteworthy that although the tubercula pubertatis in *dwesa* are not well developed, there is some similarity to the shapes seen in *belli*, which is assigned to the *P. belli* species-group characterised by thickened three septa 4/5 7/8 8/9. *P. dwesa* differs from the other species known in both species-groups by an anterior extension of the clitellum on segment 11, and very specific shapes of nephridia.

Proandricus injasuti sp. n.

(Fig. 6)

Etymology: Named after the type locality of Injasuti.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Holotype NMSA/Olig.03204 clitellate, Drakensberg, Injasuti (29º09'86"S:29º50'37"E) section of Giants Castle Game Reserve, found between grasses and on surface of road, after heavy rain. Paratypes: NMSA/Olig.03205 8 clitellate gathered with holotype. Type material collected 24 April 2000 by M. White. Other material: NMSA/Olig.03203 juvenile specimen found after rain near cave in same area, 1 January 2000 by D. G. Herbert.

Description based on holotype and paratypes.

External characters:

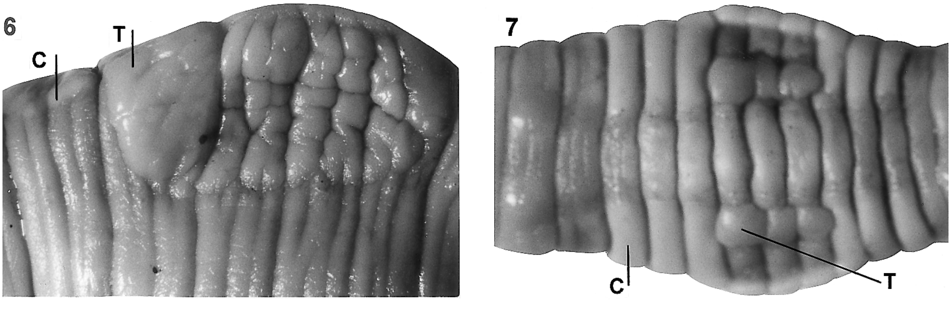
General: Body cylindrical in life; when preserved slightly flattened in clitellar area. *Colour*: In life dorsally dark-violet, ventrally light-grey; alcohol-preserved dorsally dark-grey, ventrally greyish. *Dimensions*: In life, holotype not stretched, over 600 mm long, 10 mm wide. Preserved and contracted 452 mm long, 6 mm wide at segment 10, 18 mm at tubercula pubertatis. Paratypes preserved 290–480 mm long, 16–18 mm at tubercula pubertatis. *Segment number*: Holotype 607. *Prostomium*: Prolobous, large.

Segmentation: Secondary annulation present on preclitellar segments; 1 and 2 very short, both with irregular longitudinal grooves; 3 simple, long as first ringlet of segment 4; 4–6 with two simple ringlets, similar in size and appearance; 7–9 with two irregularly annulated ringlets, decreasing in width; 10 and preclitellar, narrow, irregularly annulated; clitellar segments widened, dorsally smooth, ventrally annulated; postclitellar contracted, short. *Setae*: Closely paired, minute; postclitellarly *aa* > *bc*, *ab* = *cd*; first pairs on segment 3; on preclitellar annulated segments on first ringlet. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in intersegmental furrow 2/3. *Female pores*: In 14, slightly above ventral edges of clitellum. *Male pores*: Externally not observed; probably in intersegmental furrow 17/18, or in segment 18, where vasa deferentia enter body wall. *Spermathecal pores*: Minute, numerous openings, dorsolaterally, in intersegmental furrows 11/12 and 12/13.

Clitellar region: *Clitellum*: Saddle-shaped, yellowish-grey; commences dorsally at middle of segment 13, covering unevenly anterior segments; extends to posterior part of segment 23; ventrally extends to *cd* setal lines. *Tubercula pubertatis* (Fig. 6): Large, oval pads, on 16–19, expanding laterally and protruding above clitellum; medially with broad ventral separation; dorsal edges on 17–18 clearly separated from clitellum by soft, protruding tissues and narrow rims; lateral structure of tubercular pads on segment 16 and posterior part of 1/n19 smooth; on segments 17–18 pads are covered by irregular vertical and longitudinal grooves. *Papillae*: In *ab* setal lines, prominent on segments 10–13, moderate on 21–25; all associated with genital glands.

Internal characters:

Septa: 4/5 thin, firm; 5/6 and 6/7 thin; 7/8 and 8/9 very much thickened, muscular, massive, very strong; other septa thin, firm. *Gizzard*: In 7, muscular, posteriorly soft. *Calciferous glands*: Paired, dorsolateral, dorsally and ventrally with narrow grooves. *Intestine*: Commences in 13. *Typhlosole*: Commences parallel with intestine as medium sized V-shaped tube, gradually enlarging in the following segments; in holotype terminates in segment 363. *Dorsal blood vessel*: In posterior parts of segments 5–7 thin, double vessels; in 8 double, thin; in 9 very much enlarged, cordiform; in 10 and following segments simple. *Paired dorsoventral vessels*: In 5–8 thin, in 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; coiled loops with V-shaped caeca.



Figs 6–7. *Proandricus* species. Clitellar region, ventral view. 6. *P. injasuti* sp. n. 7. *P. martensi* sp. n. [C = clitellum; T = tuberculum pubertatis.]

Reproductive organs: *Spermiductal funnels*: Proandric arrangement (in segment 10); one pair of iridescent funnels, enclosed in separated sacs. *Vasa deferentia*: Two single ducts proceed from spermiductal funnels at their lateral sides in segment 10, and immediately turn backward and run nearly medially and parallel to axis of body, to segment 18 where they enter body wall; it was not established if they enter into male pores at intersegmental furrow 17/18 or in segment 18. *Seminal vesicles*: One pair of large, elongated vesicles commences at septa 10/11, in close connection with sacs of spermiductal funnels; both sacs extend backward through segments 11 and 12, and medially displace septum 12/13 into segment 13; it is difficult to establish if septum 12/13 is partly broken or only much extended to allow placement of vesicles in segment 13. S*permathecae*: Elongated, irregularly-shaped, curved, bent or tubular twisted thecae, with slightly thicker bases entering body wall in intersegmental furrows 11/12 and 12/13; 5–6 spermathecae at each side; iridescence was observed in some spermathecae, confirming presence of sperm. *Ovaries*: Not observed. *Genital glands*: Flat, multi-divided, thick glands, in segments 10–13 and 21–24, 25.

Biological notes: Collected in Injasuti, an area of the Giants Castle Game Reserve, under protection of the KwaZulu-Natal Nature Conservation Services. There are large open areas of indigenous grassland with small patches of indigenous bushes. Specimens were gathered on the soil surface, between grasses, on paths and open roads, after heavy rainfall. Large casts were observed between tall grasses. The clitellate specimens with iridescent spermiductal funnels and spermathecae collected in April, indicate maturity in summer and sexual activity extended into autumn.

Discussion: Characterised by thickened septa 7/8 and 8/9, and spermathecal pores in two intersegmental furrows 11/12 and 12/13; *injasuti* belongs to the *P. colletti* species-group. Similar to *ortyi* and *thornvillensis* being large, having the tubercula pubertatis extended laterally and typhlosole commencing in segment 13. Similar to *bergvillensis* in extension of the seminal vesicles through segments 11–12 and penetration into segment 13, a character not observed in *thornvillensis*. *P. injasuti* differs from the other species of this group in the shape of the tubercula pubertatis, number and allocation of papillae, and number and shape of genital glands.

Proandricus martensi sp. n.

(Fig. 7)

Etymology: Named for Dr K. Martens from the Royal Belgian Institute of Natural Science, who assisted Dr M. Hamer of the School of Botany & Zoology, University of Natal, Pietermaritzburg, in collecting the type specimen.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Holotype NMSA/Olig.03525 clitellate, Drakensberg Gardens, Mzimkulwane area (29°42'S:29°19'E) on surface of path during rainy day, 16 February 1998, M. Hamer and K. Martens leg. Paratypes: NMSA/Olig.03526 3 clitellate and 3 juvenile, Underberg area (29°46'S:29°32'E), Tegwan Farm, from pasture at *ca.* 15 cm depth, 23 November 2001, A. Sanders leg.

Description based on holotype and paratypes.

External characters:

General: Body cylindrical. *Colour*: Alcohol-preserved whitish-grey. *Dimensions*:

Preserved holotype 115 mm long, 4 mm wide at segment 10, 6 mm at tubercula pubertatis; paratypes 92+ –145 mm long, 7 mm wide at segment 10, 8 mm at tubercula pubertatis. *Segment number*: Holotype 326, paratypes (abscides197+) and 300. *Prostomium*: Prolobous, moderate. *Segmentation*: Secondary annulation present on preclitellar segments; 1 and 2 with longitudinal grooves; 3 simple, as long as first ringlet of segment 4; 4–8 with two simple ringlets, similar in size and appearance; 9 with two ringlets, second shorter than first; segments 10–12 and postclitellar simple. *Setae*: Small, closely paired; first pairs of *ab* on segment 3; on annulated segments on first ringlet; postclitellarly *ab* nearly equal to *cd*. *Nephridial pores*: Conspicuous, near *cd* setal lines; first pair in intersegmental furrow 3/4. *Female pores*: In 14, slightly below *ab* setae. *Male pores*: Externally not evident; probably in segment 18, or in intersegmental furrow 17/18 or 18/19, this position suggested by vasa deferentia entering body wall in segment 18. *Spermathecal pores*: In intersegmental furrows 11/12 and 12/13.

Clitellar region (Fig.7): *Clitellum*: Saddle-shaped, segmented; on holotype on 13–23 with clitellar tissues on segment 13 much thinner than on following clitellar segments; on paratypes all clitellar segments 13–23 evenly covered. On segments 13–16 and 20–23 clitellar ventral edges extended nearly to *ab* setal lines; on 17–19 terminating at edges of tubercula pubertatis. *Tubercula pubertatis*: On segments 17–19, close to *ab* setae, a pair of narrow, swollen, segmented ridges extending longitudinally; segmented surfaces extending between lateral borders of ridges and clitellar borders becoming vertically stretched, curved and at joints with clitellum they modify into longitudinal cavities. On paratypes a ratio of the curved segmental surfaces converted into cavities varies; it could be due to different states of maturity. *Papillae*: On 10 and 11 paired, small swellings around *ab* setae; on 12 and 24 moderate in size, swollen tubercles containing *ab* setae; all associated with genital glands.

Internal characters:

Septa: 4/5 5/6 6/7 thin, not thickened; 7/8 and 8/9 thickened, muscular, similar in size and appearance; other septa thin, firm. *Gizzard*: In 7, muscular, posteriorly soft. *Calciferous glands*: In 9, globular, connected with oesophagus vertically; distantly separated dorsally and ventrally. *Intestine*: Commences in 13. *Typhlosole*: Commences in 13 as narrow V-shaped tube, gradually enlarging, and in segment 20 becoming large and U-shaped; terminates in holotype in 133, in paratypes 128–147. *Dorsal blood vessel*: In 4–7 double only in posterior parts of segments, not separated; in 8 double, separated; in 9 double, cordiform; single when crossing septa, in 10 and in the following segments. *Paired dorsoventral vessels*: Thin vessels in 5–8, enlarged, moniliform in 9–11. *Nephridia*: Meganephridia; coiled loops and V-shaped, short caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement (in segment 10); one pair of large funnels enclosed in common sac; both funnels closely connected with seminal sacs at posterior part of segment 10; iridescence confirms presence of sperm. *Vasa deferentia*: Single ducts commence from spermiductal funnels at their lateral sides and run backward medially at each side of body to segment 18, where they enter body wall; it is difficult to determine exact entry to male pores because these are not marked externally; probably they are in intersegmental furrow 18/19 or 17/18. *Seminal vesicles*: One pair of moderate vesicles, anteriorly connected with spermiductal funnels at septum 10/11, and confined to segment 11. *Spermathecae*: Two pairs per segment near septa

11/12 and 12/13; tiny, irregularly shaped thecae; anterior pair much smaller than posterior. *Ovaries*: Not observed, covered by body wall tissue. *Genital glands*: In segments 12 and 24; paired, moderate in size and similar in appearance, two-folded, elongated glands, associated with papillae.

Biological notes: Collected on outskirts of Drakensberg escarpment, in Afromontane forest with alien plantations of wattle and pine trees. Holotype associated with the new species *michelleae*, described below. Paratypes found in Drakensberg foothills were associated with the introduced species *Octolasion lacteum* (Oerley, 1885), which occurs commonly in the neighbouring pastures and grasslands.

Discussion: *P. martensi* can be assigned to the *P. colletti* species-group, having only septa 7/8 and 8/9 thickened and spermathecal pores in two intersegmental furrows 11/12 and 12/13. Similar to my new species *michelleae*, but both species differ distinctly in the shape of the clitellum and tubercula pubertatis.

Proandricus michelleae sp. n.

(Fig. 8)

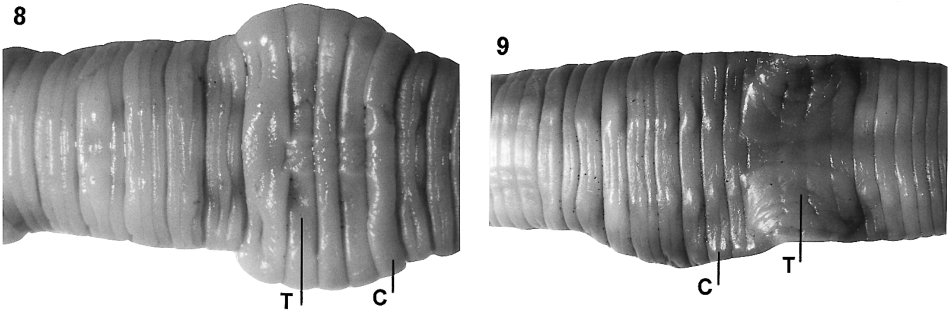
Etymology: Named for Dr M. Hamer of the School of Botany & Zoology, University of Natal, Pietermaritzburg, who collected and donated the type material to the Natal Museum.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Holotype NMSA/Olig.02713, Drakensberg Gardens, Mzimkulwane area (29°42'S:29°19'E) on surface of path during rainy day, 16 February 1998, M. Hamer and K. Martens leg. Paratype: NMSA/Olig.02714 collected together with holotype.

Description based on holotype and paratype.

External characters:

General: Body cylindrical, flattened at clitellum and in the area of tubercula pubertatis. *Colour*: Alcohol-preserved yellowish-grey. *Dimensions*: Preserved holotype 110 mm long, 4 mm wide at segment 10, 7 mm at tubercula pubertatis. Paratype 134 mm long, 5 mm wide at 10, 7 mm at tubercula pubertatis. *Segment number*: Holotype 383. *Prostomium*: Prolobous, moderate. *Segmentation*: Secondary annulation present on preclitellar segments; 1 and 2 short, with



Figs 8–9. *Proandricus* species. Clitellar region, ventral view. 8. *P. michelleae* sp. n. 9. *P. richerti* sp. n. [C= clitellum; T = tuberculum pubertatis.]

longitudinal grooves; 3 simple, as long as first ringlet of segment 4; 4–8 with two simple ringlets, similar in size and appearance; 9 with two ringlets, second shorter than first; segments 10–12 simple, irregularly annulated, postclitellar simple. *Setae*: Moderate in size, closely paired; first pairs on segment 3; on annulated segments on first ringlet; setal distances of *aa* are not constant on some preclitellar and on some postclitellar segments; on 9–13 *aa* setae are slightly closer than these on 15–16; on 17–20, covered by tissue of the tubercula pubertatis, probably located similarly to these on16; on 21–30 distances slightly increasing; *ab* = *cd* on all segments; on segments 31 and the following aa > bc. *Nephridial pores*: Conspicuous, in *cd* setal lines; first pair in intersegmental furrow 3/4. *Female pores*: In posterior part of 14, between *b* and *c* setal lines. *Male pores*: It is difficult to establish exact position: two clear, elongated depressions in segment 16 slightly above *ab* setae suggest presence of male pores; however, in the same segment, medially, near to intersegmental furrow of 16/17, is a longitudinal, single concavity. It can include the pore or pores into which vasa deferentia enter; in dissected specimen vasa deferentia were observed in anterior part of segment 17, close to the external middle cavity; however, in intersegmental furrow 17/18, laterally to tubercula pubertatis are two clear openings that may be male pores. *Spermathecal pores*: Not observed externally; position of spermathecae noted during dissection indicates they are in intersegmental furrows 11/12 and 12/13.

Clitellar region (Fig. 8): *Clitellum*: Saddle-shaped, segmented; on segments 13–23, although clitellar tissues cover segment 13 only dorsally in the middle portion; on 13–15 ventral edges terminate at *cd* setae; on 16–20 at edges of tubercula pubertatis; on 21–23 clitellum extends slightly below *cd* setae. *Tubercula pubertatis*: On segments 16–20, segmented; on 17–19 marked by brownish colour; vertically stretched rectangles, medially separated and rimmed with narrow strips, extended laterally to clitellar borders; bordering clitellum on 1/n16–1/n20 with clear, enlarged rims. *Papillae*: A pair of moderately sized, swollen tubercles around *ab* setae on 12, associated with genital glands.

Internal characters:

Septa: 4/5 5/6 6/7 thin, not thickened; 7/8 and 8/9 thickened very much, muscular, similar in size and appearance; other septa thin, firm. *Gizzard*: In 7; small, anteriorly muscular, posteriorly soft. *Calciferous glands*: In 9, lateral; separated dorsally and ventrally. *Intestine*: Commences in 13. *Typhlosole*: Commences in 13 as large U-shaped tube; in holotype terminates in segment 170. *Dorsal blood vessel*: In 5 and 6 double, close; in 7 double in only posterior part, close; in 8 double, separated; 9 double, cordiform; single when crossing septa, in 10 and following segments. *Paired dorsoventral vessels*: Thin vessels in 5–8; in 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; coiled loops and V-shaped caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement (in segment 10); one pair of large funnels enclosed in common sac; closely connected with seminal sacs at posterior part of segment 10; iridescence confirms presence of sperm. *Vasa deferentia*: Single ducts run medially at each side of body to anterior part of segment 17, when they enter body wall; it is difficult to establish which cavities noted externally on segment 16 or intersegmental furrow 17/18 correspond with vasa deferentia. *Seminal vesicles*: One pair of large vesicles anteriorly connected at septum 10/11 with spermiductal funnels;

elongated, confined to segment 11; bent vertically and closely touching each other dorsally. *Spermathecae*: One pair per segment near septa 11/12 and 12/13; tiny, tubular, bent or coiled tubes based on small thickenings. *Ovaries*: Not observed, covered by body wall tissue. *Genital glands*: A pair of moderately sized and similar appearance, ventrally in segment 12; twice-folded, elongated glands; associated with papillae.

Biological notes: Collected in outskirts of Drakensberg escarpment, in a patch of Afromontane forest invaded by alien plantations of wattle and pine trees. Associated with the new species *martensi*, described above.

Discussion: This species belongs to the *colletti* species-group. It is similar to the new species *martensi*, having spermathecal pores in intersegmental furrows 11/12 and 12/13 and clitellum on segments 13–23. However, the shapes of the clitellum and tubercula pubertatis are distinct in both species.

Proandricus richerti sp. n.

(Fig. 9)

Etymology: Named for Mr S. Richert of the KwaZulu-Natal Nature Conservation Service, who assisted Dr A. J. Armstrong in collecting the type material.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Holotype NMSA/Olig.03540 clitellate, Vergelegen Nature Reserve (29°33'41.786"S: 29°29'36.563"E), plateau covered by grass and herbs, burnt in June 2001, in moist soil at depth of 1–30 cm, 31 December 2001. Paratypes NMSA/Olig.03541 3 clitellate and 13 juveniles found together with holotype; all collected by A. J. Armstrong and S. Richert.

External characters:

General: Body cylindrical, extended laterally in area of tubercula pubertatis. *Colour*: In life dorsally violet in preclitellar part, ventrally yellowish-white. Alcohol-preserved dorsally with violet tint, ventrally yellowish-grey. *Dimensions*: Holotype preserved slightly contracted, abscised 125+ mm long, 7 mm wide at segment 10, 9 mm at tubercula pubertatis. Paratypes: Clitellate, abscised, *ca*. 40–80 mm long; juvenile 30–230 mm long. *Segment number*: Abscised holotype 255+, juvenile paratypes 360–489. *Prostomium*: Prolobous, moderate. *Segmentation*: Secondary annulation present on preclitellar segments; 1 and 2 clearly separated one from another, short, simple, both with irregular longitudinal grooves; 3 simple, longer than 1 or 2; 4–8 with two simple ringlets, similar in size and appearance; 9 with two ringlets, second shorter than first; 10–12 simple; postclitellar simple, randomly annulated. *Setae*: Closely paired; moderate in size; first pairs on 3; on 4–9 on first ringlet; on postclitellar segments *aa* > *bc*, *ab* = *cd*. *Nephridial pores*: Conspicuous, in *cd* setal lines; first pair in 2/3 intersegmental furrow. *Female pores*: Not observed. *Male pores*: Probably in 17/18 intersegmental furrow in area of tubercula pubertatis, where there are small depressions. *Spermathecal pores*: Externally not detected; during dissection found in intersegmental furrows 11/12 and 12/13.

Clitellar region (Fig. 9): *Clitellum*: On holotype and mature paratypes marked by brownish colour on segments 13–23; ventral edges in line of tubercula pubertatis. *Tubercula pubertatis*: On holotype large, rectangular pads with rounded corners, on 1/n16–20; rimmed at dorsal borders; on paratypes markedly less than on holotype, rimmed dorsally. *Papillae*: Very small tubercles in line of *ab* setae on variable segments 10–12.

Internal characters:

Septa: 4/5 5/6 6/7 very thin; 7/8 and 8/9 much thickened, muscular, firm, similar in size and appearance. *Gizzard*: In 7, elongated, muscular. *Calciferous glands*: In 9; moderate in size, laterally; separated dorsally and ventrally. *Intestine*: Commences in 13; in segments 23–28 paired elongated diverticula. *Typhlosole*: Commences immediately with intestine as thin tube, gradually enlarging and becoming U-shaped, thick structure; in abscised holotype terminates in segment 178; in juvenile paratype consisting of 489 segments and terminates in 180, leaving over 300 segments with no typhlosole. *Dorsal blood vessel*: In segments 4–7 double in posterior parts, separated; in 8 double, widely separated; in 9 double, large, cordiform; single when crossing septa, in 10 and the following segments; 4–8 thin tubes; in 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; coiled loops with short, thick V-shaped caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement (in segment 10); in holotype moderate in size, iridescent. Also in paratype with clitellum marked only by brown colour, a trace of iridescence was observed in small spermiductal funnels; both funnels closely connected with seminal sacs at posterior part of segment 10. *Vasa deferentia*: Single ducts commence at dorsal parts of spermiductal funnels, and run backwards almost medially at each side of the body to segment 17, where they enter body wall. *Seminal vesicles*: One pair of moderate sacs, anteriorly connected at septum 10/11 with spermiductal funnels, extending backward to segments 11 and 12; in holotype both vesicles are elongated and of equal size, but when crossing septum 11/12 becoming narrower; in paratype both vesicles smaller than in holotype, extending equally through segments 11 and 12 (probably the differences in size and shape can be accounted to different states of maturity). *Spermathecae*: Close to septa 11/12 and 12/13; variable in shape and size, very small, bent ampullae; 3–4 at each side in segments 12 and 13. *Ovaries*: Not observed. *Genital glands*: In segment 10 two simple, elongated, straight, narrow glands; in segment 21 similar in size to glands of segment 10, but twice-folded and bent posteriorly; in segment 22 only one gland, finger-shaped.

Biological notes: The type locality is located in the Drakensberg foothills at *ca*. 1500 m, where there is a deep valley with steep hillsides covered by indigenous bushes and open grassveld (Pooley & Player 1995). During earlier years the area was used for grazing, but has never been ploughed or been arable land. The types were found on the plateau covered by grass and herbs, and were dug out at a depth of 1–30 cm from moist soil and from between grass roots. A large part of the grassland had been burnt about six months previously. Earthworm presence between the roots of burnt grasses indicates an ability to migrate into deeper soil during unfavorable conditions, and a return to the top layer when conditions permit. The species is probably restricted to the outskirts of the Drakensberg range.

Discussion: *P. richerti* belongs to the *P. colletti* species-group, having only septa 7/8 and 8/9 thickened, and spermathecal pores in intersegmental furrows 11/12 and 12/13. Similar to *bergvillensis* in the backward extension of the seminal vesicles, and relatively short typhlosole. However, extension of the seminal vesicles in *richerti* probably does not cross septum 12/13. Also the shape of the tubercula pubertatis differs in both species.

The length of the typhlosole in this new species is worthy of special note, as it is exceptionally short, occupying only a little more than one-third of the body segments. In the other species of the genus, the typhlosole extends to about two-thirds of the segment number, leaving only about one-third of segments without typhlosole. The presence of diverticula is also characteristic of this species.

marleyi species-group

To this group are assigned *P. marleyi* Michaelsen, 1928 and *P. alatus* Plisko, 1996.

Proandricus armstrongi sp. n.

(Fig. 10)

Etymology: Named for Dr A. J. Armstrong of the KwaZulu-Natal Nature Conservation Service, who collected and donated this species to the Natal Museum.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Holotype NMSA/Olig.03494 clitellate, well preserved, abscised postclitellarly, collected at Mount Currie Nature Reserve [Kokstad district; an extension of the Drakensberg foothills] (30°29'33.754"S:29°25'25.605'E), under burnt grass, beside a stream, in damp, clayey soil, 31 October 2001, by A. J. Armstrong.

External characters:

General: Body cylindrical, flattened in clitellar region. *Colour*: Alcohol-preserved dorsally dark-grey, ventrally light-grey. *Dimensions*: Preserved holotype 84+ mm long, 4 mm wide at segment 10, 9 mm at tubercula pubertatis. *Segment number*: 177+. *Prostomium*: Prolobous, small, inverted into buccal cavity. *Segmentation*: Secondary annulation present on preclitellar segments; segment 1 and 2 short, with longitudinal, irregular grooves; 3 simple, as long as first ringlet of segment 4; 4–6 with two simple ringlets, similar in size and appearance; 7–9 with two annulated ringlets, second shorter than anterior; 10–12 short, simple, with irregular annulation; clitellar simple, longer than preclitellar; postclitellar very short, simple. *Setae*: Closely paired, minute; postclitellarly *aa* = *bc*, *ab* = *cd*. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in intersegmental furrow 3/4. *Female pores*: In 14, slightly above *b* setae. *Male pores*: Probably at tubercula pubertatis in furrow 17/18. *Spermathecal pores*: Minute, in intersegmental furrows 11/12 and 12/13, dorsolaterally.

Clitellar region (Fig. 10): *Clitellum*: Saddle-shaped, flattened, segmented, yellowish-white; on 13–22, extending onto small section of segment 23; clearly bordered anteriorly; ventral borders extend to *c* setal lines. *Tubercula pubertatis*: On 17–19, large, nearly square pads, segmented, between *b* and *cd* setal lines. *Papillae*: Small paired swellings around *ab* setae on segment 9 and 23; on segment 9 the swellings extend laterally to *c* setae.

Internal characters:

Septa: 4/5 moderately thickened, elastic, not muscular; 5/6 very much thickened and muscular, nearly one mm thick; 6/7 very thin, probably even partly lost; 7/8 thickened, muscular, but much thinner than 5/6; 8/9 not thickened, firm; subsequent septa in preclitellar segments elastic, firm, similar in thickness to septum 8/9; postclitellarly thinner. *Gizzard*: Large, muscular, anteriorly wider than in posterior part. *Calciferous glands*: Ventro-laterally, in segment 9; dorsally widely separated. *Intestine*: Commences in 13. *Typhlosole*: Commences in 13, parallel with intestine, as U-shaped tube. *Dorsal blood vessel*: In 5 not observed, covered by thick, muscular septum; in 6–7 partly double, close; 8 double, separated; 9 double, cordiform. *Paired dorsoventral vessels*: 6–8 thin vessels, 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; in preclitellar segments large and very much coiled spiral loops, and large V-shaped caeca; postclitellarly smaller loops and shorter caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement (in segment 10); one pair of funnels enclosed in common sac. *Seminal vesicles*: One pair, moderately sized; vesicles commence at septum 10/11 and extend into segment 11. *Vasa deferentia*: Not observed; covered by thick body wall tissues. *Spermathecae*: Two pairs per segment; coiled or bent tubes, each based on rounded thickenings, close to septa 11/12 and 12/13 respectively. *Ovaries*: Not observed; covered by thick septum and large coiled loops of nephridia. *Genital glands*: In segment 9 and 22; anterior pair four-folded, white, short sausage-shaped glands; posterior pair composed of four-folded, yellowish, elongated tubular glands; both pairs corresponding with papillae of segments 9 and 23 respectively.

Biological notes: The type locality is a part of a large extension of the Drakensberg foothills, in the Mount Currie Nature Reserve. The vegetation there comprises montane grasslands, with scrub and *Protea* veld on the slopes; there are streams with wetland vegetation, small forest patches and clumps of indigenous *Leucosidea* bushes (Pooley & Player 1995). The type was dug out from damp, clayey soil under recently burnt grass on the bank of a stream. This clitellate, mature specimen was found in October, after a short period of rainy days, indicating sexual reproduction in spring and early summer.

Discussion: *P. armstrongi*, having a thickened septum 5/6, and with the position of its spermathecal pores in two intersegmental furrows 11/12 and 12/13, can be assigned to the *P. marleyi* species-group, comprising only two other species: *alatus* and *marleyi*. The new species differs from *alatus* by having a thickened septum 4/5, the clitellum on 12–23, and the tubercula pubertatis differently shaped. From *marleyi* it differs by a lack of a thickened septum 8/9, and having other septa much stronger than those observed

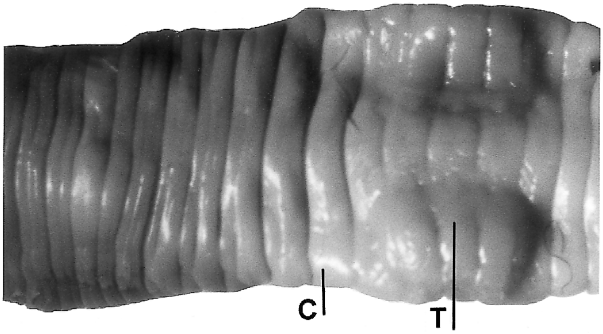


Fig. 10. *Proandricus armstrongi* sp. n. Clitellar region, ventral view. [C = clitellum; T = tuberculum pubertatis.]

by Michaelsen (1928) in the type material of *marleyi*.

DISCUSSION

Each of the 46 presently known species of *Proandricus* (39 % of the known 119 species of the endemic South African family Microchaetidae) appears to be restricted to a narrow range, mainly in the south-eastern and eastern parts of South Africa. Many are known only from single records. These proandric species occur mainly in natural habitats, or minimally disturbed areas. Five of the nine species described above—*armstrongi*, *crookesi*, *hlatikulu*, *injasuti*, *richerti*—were collected in sites conserved by the KwaZulu-Natal nature Conservation Service; one (*dwesa*) was in a conserved area of the Eastern Cape Province. The remaining three species – *sani*, *martensi* and *michelleae* – were not found in Nature Reserves. However, they occur in natural habitats at high altitudes in the Drakensberg escarpment, so possibly have natural protection against human intervention.

Only three of the known *Proandricus* species: *marenzelleri* (Rosa, 1897), *modestus* (Michaelsen, 1899) and *timmianus* (Michaelsen, 1933), have so far been collected close to human habitations or in cultivated lands (Ljungström & Reinecke 1969; Pickford 1975; Plisko 2000*b*; Reinecke 1983). *P. londti* Plisko, 1993 was found and described from garden soil in the Pretoria area, into which it had probably been introduced. This species was collected many years before in the Masite Mountains of western Lesotho at *ca*. 1500–2000 m, from where it may have been was transported into the garden soil of its type locality (Irene near Pretoria) (Plisko 1993 1994). All other known species of *Proandricus* were found in natural habitats. Members of this genus, as it is the case with Microchaetidae in general, are probably highly intolerant of disturbance, pollution and chemical influence.

The reduction of natural biotopes permanently in progress, is in tandem with agricultural and industrial demands, and reduces space for indigenous flora and fauna. This is cause for concern; the consequences of elimination and even extinction of important soil-forming organisms such as the indigenous South African earthworms have been underlined by oligochaete specialists (Ljungström 1972, Pickford 1975, Plisko 2000*a*). It is urgent that an inventory of the South African oligochaete fauna should be made as rapidly as possible, so that a baseline can be made available for monitoring deterioration of the soil fauna. It should also be realised that the protected areas comprising less disturbed natural habitats will probably become the only refuges for many indigenous species that are constantly under threat of extinction by destructive human practices. Conservation of endemic biotopes is highly recommended.

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